

Vermont Farm Methane Project Quarterly Report

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Introduction:

The Vermont Department of Public Service (DPS) and the Vermont Department of Agriculture (AGR) received a \$300,000 appropriation from the FY 2000 federal budget to promote the use of methane recovery technology on Vermont dairy farms. This technology has the potential to help farmers with their nutrient management plans and at the same time provide additional on-farm income. The goal of this project is to identify and help overcome key strategic hurdles to widespread adoption of methane recovery technologies by Vermont farmers.

The project was designed to consider methane recovery in a broad context, taking into account its potential benefits as a component of a comprehensive nutrient management system, as a renewable energy source and as a strategy for greenhouse gas reduction.

PROJECT ACTIVITIES July 1, 2001 - September 30, 2001

Organizational:

The project has been awarded Phase II funding through a budget appropriation for FY 2001 and is developing a 3 year project implementation plan for this money. The plan calls for using one third of the money for project administration and outreach, one third toward research and development and one third to be used for cost share for installations.

Although the grant money was committed in FY 2001, it has not been transferred to the DPS yet. Once this money is obligated, the DPS plans to contract with the Biomass Energy Resource Center (BERC) for overall project management.

BERC recently incorporated as a not-for-profit private corporation with the mission of promoting and developing biomass energy projects. This is a project oriented organization that hopes to work on biomass projects in Vermont, the Northeast and globally. Vermont has considerable experience in small and medium scale biomass projects and the goal of this organization is to export that expertise by facilitating specific projects. The Vermont Methane Project is in the process of setting up a part time staffing position at the Biomass Energy Resource Center that will be specifically devoted to this project.

The Project Executive Committee held a meeting on August 30. Attached is an agenda from that meeting. A Project Advisory Committee meeting was scheduled for October 19, 2001.

Foster Bros. Dairy Farm research and demonstration site:

Foster Bros. have a two chambered side-by-side digester that they have been using successfully for over 15 years. The Vermont Methane Project has isolated these into two separate digesters so that we can experiment with various materials and technologies and still maintain a control that we know works.

Fosters began loading the digester in December. Although they encountered some delays getting the system on line and has been producing biogas generated electricity since January. Next steps include designing and implementing a data collection protocol and performing specific experiments using this side-by-side digester. We did collect some samples for volatile acid analysis and are working through problems of sampling through the 1 inch ports. We should be ready to try a thermophilic trial soon. This is an area that many are excited about. If we manage to maintain a practical cost effective thermophilic reaction we have the potential of cutting the digester reactor vessel cost in half.

Feasibility Studies:

We have compiled the preliminary feasibility studies. Sixteen farms initially expressed interest in methane recovery systems and were contacted. Of those farms:

- # 2 were small diversified farms and were not practical to consider.
- # The rest were provided Phil Lusk casebook on methane and more information was gathered.

Five farms decided not to pursue the technology further than gathering the basic information. Of the farms we visited:

- # Two were hot water systems for small farms
- # One milked 35 cows and had been in Peace Corps and wanted a hot water heating system. Stan Weeks, our consulting engineer, did a site visit. We concluded, with the farmer, that the manure was too dry as it was coming out of the barn and it would not be cost effective to change to liquid system.
- # One milked 75 cows and operated a Bed and Breakfast. They had large hot water an space heating needs. However it was also not practical with the current manure system. They may be changing some housing systems and may be re-considered if a liquid manure system is used.
- # On 7 farms we did an AgStar analysis. This was to show us which farms had a reasonable chance of cost effectiveness. Of the 7 farms:
 - # Four had a reasonable cashflow (≤ 7 year payback)
 - # One is proceeding to the design phase
- # One beds with sand and after engineering analysis was not recommended but will be revisited in Phase II to see if a solution can be developed.
- # One is still in the planning stage and will be pursued if built (1000+ cows).

- # One is planning expansion and only cashflows after the expansion. We will follow-up with them to see if they move forward with the expansion.
- # Three had unacceptable rate of return (9 to 13+ year paybacks)

Our overall feasibility conclusions are:

- # On retrofit scenarios with electrical generator systems, digesters will not be self-supporting on energy with less than 500 cows.
- # Ancillary benefits will need to sway the 300 to 500 cow dairies to the technology or the cost/payback ratio will need to change.
- # System payback is marginal compared to other uses for the money.
- # Gas only systems may fit but only on small farms with liquid manure systems.

Site Specific Engineering Studies:

We have begun designing a system for a 800 cow farm in Addison County and want to investigate a series of options for this site. The farmer has committed to working with us through the design phase. Natural Resources Conservation Service and the Otter Creek Natural Resources Conservation District is partnering with us on this project. The over all project includes both a digester and a rotary composter. The plan is to do a controlled study on the use of composted manure solids as a substitute for traditional bedding as well as the methane digester. The engineering is starting in October 2001.

Outreach:

Out-of-state Outreach

Dan traveled to Washington, DC to give a presentation summarizing Phase I of the project. The meeting was coordinated by CONEG to help facilitate communication channels between the exciting projects taking place around the Northeast. It was a worthwhile meeting. Dan will be further coordinating with NYSEDA by speaking at an "Innovation in Agriculture" forum in Syracuse, NY.

In-state Outreach

One of the benefits of setting up our research project at Foster Brothers Farm in Middlebury is that it is an excellent demonstration site. The Fosters have nearly 20 years of experience with this technology and related systems and they are very excited about some of the experiments we are performing there. They are terrific tour guides and have a tremendous amount of practical knowledge to share.

Over the past quarter, we have toured this site with a number of different groups. These tours allow us to display some of experimental technology and it gives us a good opportunity to discuss with other individuals, groups and organizations possibilities for collaboration. Below are a list of some of the tours we have given over the past few months.

- # May 28th, toured Fosters with Kathryn Parker , Senior Research Fellow for Senator Jeffords Office.
- # July 20th, toured Fosters with Tim Maker, Executive Director of the Vermont Biomass Energy Resource Center and David Leslie, a professional engineer who has ties to a Chinese program that promotes methane recovery.
- # August 17, toured Fosters with Gillian Eaton of Efficiency Vermont, Jeff Sicox of Hallam Engineering and Jim Jutras of the Town of Essex Public Works Department. The Town of Essex has an anaerobic digester as part of their sewage treatment facility and are very interested in using the methane gas for electrical generation. Currently they just use the gas for heat and they flare any excess. Interestingly, the Essex facility has some very sophisticated monitoring equipment and they are interested in setting up a system that could document outputs. Hallam Engineering has put together a feasibility study that analyzes the costs of installing a micro-turbine at this Essex facility.
- # August 31, toured Fosters with Steve Allenbee, Chair of the Board of the Biomass Energy Resource Center and Craig Parenzan Senior Vice President of Business Development for Central Vermont Public Service. CVPS is interested in exploring business opportunities related to methane recovery. We talked about both technology development and the notion of establishing a business service that focused on the energy output piece of the process.

New Inquires:

The Brattleboro Retreat recently sold its farm operation to a non-profit educational foundation. This foundation, the Windham Foundation, is interested in addressing some of the nutrient management issues on the farm and hired Steve Hoyt to prepare a feasibility study for methane recovery and nutrient management on this 100 cow farm. The interesting aspect about this farm is that they have a substantial electrical load nearby that could conceivably benefit from any excess capacity if the farm was producing electricity. Jeff went to a meeting where this proposal was presented to the key decision makers and the project has offered to help with their project if they decide to install an anaerobic digester. The project will stay in contact with the key players over the coming months as they work through their plans.

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